

adapted. Prof. Thompson has chosen to classify dynamos according to the nature of the field of force and the manner in which the armature moves in the field of force. It is doubtless difficult to find any very satisfactory mode of classification of these machines: but the reason for the particular classification adopted here is certainly not apparent in the descriptive chapters, in which the nature and effect of the field in the various machines is perhaps the point on which a great deal more information would be desirable. The diagrams and figures in these chapters are all that could be wished for. They are admirably chosen and are well executed.

The mathematical theory of the dynamo machine has of late received considerable accessions; though much yet remains to be done in working out a satisfactory theory by mathematics and experiment combined. The fundamental principles are well known. The experiments of Faraday and Joule, and the mathematical investigations of Helmholtz, Sir William Thomson, and Clerk-Maxwell have formed a good foundation; and considerable advances have recently been made by the labours of Joubert, Mascart, Hopkinson, and Marcel Deprez. The invention by Hopkinson of the "characteristic curve" is a most important step; and the study of these curves is at the present time doing for the dynamo machine the same thing that the study of Watt's indicator diagram does for the steam-engine.

Prof. Thompson devotes a considerable number of chapters to the mathematical theory of the dynamo, and his treatment of the subject is on the whole satisfactory. There are, however, a few points on which in our opinion it requires revision. One of these is the notation; and it would be a great satisfaction if mathematicians and electricians could by some means—for instance, by appointing a committee for the purpose—agree upon some standard notation which would be convenient, and which would harmonise with notations commonly employed in dynamics and in general physics. In several points we could wish to see Prof. Thompson's notation different. It seems, to say the least, a very great pity to use the letter *H* in mathematical writing connected with magnetism for any purpose besides Earth's Horizontal Force, while the use of the letter *i* for strength of the current is only a perpetuation of French want of logic.

Prof. Thompson's formulas on the subject of efficiency of a motor are not satisfactory; and it is most unfortunate that he has allowed himself to be misled by his friend, Mr. W. M. Moorsom, into fancying an error in the fundamental equation of Joubert for an alternate-current dynamo. The investigation of Appendix IV. and the physical assumption that the coefficient of self-induction for the armature and the coefficient of mutual induction for the armature and electromagnets are approximately equal in *all* dynamos will not bear examination. It is more than doubtful whether there is *any* dynamo in which this is approximately true. Certainly it would not be true for the Siemens alternate-current machine, with which M. Joubert concerned himself. M. Joubert did not leave the matter as a question of supposition; but showed by *experiment* that the term which is concerned with mutual induction is unimportant, and that on this account the differential equation in question becomes manageable.

One other blemish we cannot pass over. It is the introduction of two or three new words which have been adopted without due weighing of the consequences. That mathematicians have been too slow to form words for new ideas we quite admit; and of the advantage of good words to express clear ideas there can be no question. Witness the comfort of having such words as "radian" for the unit angle, of "volt," "ampere," "watt." But word-making may be carried too far unless caution and judgment be used; and that words so grotesque as "torque" and as "gausses" should be adopted into the English language would be, to say the least, a very great misfortune.

The faults which we have found are, however, few, and not of vital importance, and in conclusion we must once more express our gratitude to Prof. Thompson for a very valuable work. We feel confident that it will find a very wide circle of usefulness and of appreciation.

OUR BOOK SHELF

An Elementary Treatise on Conic Sections and Algebraic Geometry, with Numerous Examples and Hints for their Solution, especially designed for the Use of Beginners. By G. Hale Puckle, M.A. (London: Macmillan & Co., 1884.)

WE are not often called upon to notice the *fifth* edition of a school text-book, but now that we have examined this one and compared it with our familiar third edition copy (issued in 1868) we are glad to be able to say that, though new editions have not appeared with the sensational rapidity of some similar works of late, yet with the steady advance in public favour there has been an evident desire on Mr. Puckle's part to bring up his work to the level of other treatises on the subject. Contrasting the two editions, we find there has been an increase from 343 to 379 pages, and not only has there been careful revision, but also an addition of very many articles of interest. It is to be borne in mind that no attempt is made to bring out a work which shall satisfy the requirements of a University man who is "reading high," but the writer's aim has throughout been to write a purely *elementary* treatise on the lines of Dr. Salmon's "Conics." Mr. Puckle rightly acknowledges his great indebtedness to this now classic work, and on the other hand it should be borne in mind that the first edition came out at a time when Salmon was not openly used as a *College* text-book at Cambridge. We are very glad to notice that Mr. Puckle has, in this last edition, adopted the notation of the general equation of the second order, according to Salmon. It is quite time that this notation should be adopted in all our text-books, for it is a needless burden upon the memory to get up the several conic formulæ under different forms. A useful addition has been made to the number of worked-out exercises. A result of the book's having reached a fifth edition is that we have not noted any errata in the text.

LETTERS TO THE EDITOR

- [*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]
 [The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

The Cretaceous Flora of North America

In the abstract of a paper on the above subject by Mr. J. Starkie Gardner in *NATURE* of September 25 (p. 528), it is stated that "the lowest beds (of the American Cretaceous) are

distinguished by the presence of well-developed dicotyledonous leaves"; and further on these are said to occur at "the very base" of the formation. Now though such statements are sometimes loosely made, it should be understood that American geologists generally acknowledge that the base of their Cretaceous is, in some localities at least, only equivalent to the base of the Upper Cretaceous of Europe. In Canada, at least, the strictly Mesozoic flora of the Lower Cretaceous has been clearly distinguished from the angiospermous flora of the middle and upper parts of the series.

The oldest Cretaceous beds known in Canada are, I believe, those of the Queen Charlotte Islands, referred by Mr. Whiteaves, on the evidence of animal fossils, to the Neocomian age. The flora of these, consisting of cycads and conifers only, without any trace of dicotyledonous leaves, was described by me in the Report of the Geological Survey for 1873, and I remarked at the time on its decidedly Mesozoic aspect. It will be seen by reference to my memoir on the Cretaceous floras of British Columbia and the North-West Territories, in the *Transactions* of the Royal Society of Canada for 1883, that the oldest angiospermous flora known at that time in Western America is that of the Dakota group, described by Lesquereux and supposed to be of Cenomanian age. We have not yet found any dicotyledonous leaves quite so old in Canada. Our oldest angiospermous flora occurs in beds referred by Dr. G. M. Dawson and Mr. Whiteaves to the Niobrara group, which is approximately of the age of the Chalk Marl of England, in so far as can be judged by its animal fossils. A detailed table of the beds is given in the memoir above referred to, and the facts are stated in general terms in the "Descriptive Sketch" of the geology of Canada which was distributed to the members of the British Association (p. 51).

It will thus be seen that, though our angiospermous flora may possibly have appeared somewhat earlier than that of Europe, the discrepancy is by no means so great as stated in the abstract referred to. The correct statement would be, in so far as Canada and the western parts of the United States are concerned, that the oldest angiosperms known in America are probably of Cenomanian age, and that the older Cretaceous contains only, so far as known, a flora of Mesozoic character. Concerning the limits of the Cretaceous and the Eocene on the one hand, and the limits of the Cretaceous and Jurassic on the other, there are no doubt some unsettled questions; but these do not affect the facts above stated.

J. WM. DAWSON

Montreal, October 9

SIR J. W. DAWSON'S correction only applies to the published abstract of my paper. The editor of the *Geological Magazine* having kindly offered to publish the full text, it will be seen that its scope was limited to Cretaceous dicotyledonous floras, and the older ones, to which Sir John calls attention, were purposely excluded. The title "Cretaceous-Eocene" was intended to imply that the subject was the border-land of these two formations; but I am greatly obliged for the note and the copy of the work which accompanied it.

J. S. G.

Palæolithic Implements from Cambridge

ONLY two implements of Palæolithic age have been recorded from the neighbourhood of Cambridge. One of these is a rude form picked off a heap of gravel near the Observatory, and the other was bought from some workmen, and was said by them to have come from the Barnwell gravel. There is therefore considerable interest attached to the discovery of an implement of this age on the plateau between Upper Hare Park and the Cambridge Newmarket Road. This plateau is part of one of the old river terraces which formerly abutted against the hills on the east, but is now cut off from them by the valley along which the railroad to Newmarket runs. It belongs to an earlier period than that of the Barnwell gravel.

Further to the south, near Lark's Hall, in gravels which probably belong to the same set of river terraces, remains of rhinoceros, &c., have been found, but hitherto no implements or other traces of the existence of Palæolithic man have been brought to light in that district.

The plateau near Upper Hare Park is all unfenced arable land, and the implement which I found buried in the surface soil with only a small part of its thicker end visible, had probably been turned up out of the gravel by the plough, its surface having the same general appearance as the flints derived from the gravel. It is of the tongue-shaped St. Acheul type, and has

a fine patinated surface. It measures $5\frac{1}{2}$ inches in length, 3 inches across its broadest part, and nearly $1\frac{1}{2}$ at its thickest. One end is rounded so as to be easy to hold in the hand, and from this it tapers gradually with a sharp cutting edge to the point. On each side of the implement the edge is curiously rough and shattered, owing to the original quality of the flint and the way in which the flakes broke off when it was being made.

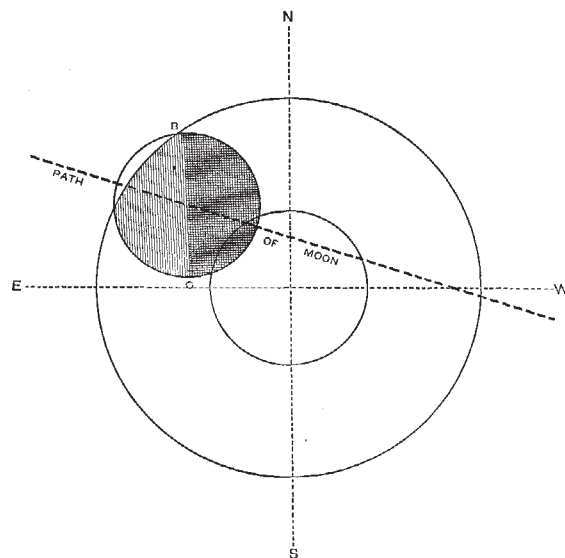
Not very far from the spot where it was found, skirting the carriage-drive which leads up to the house, are several small hollows from which level has most likely been dug. In these hollows and all round their margin the ground is covered with flints belonging to the gravel, and amongst them I found quantities of flint chips, one or two very nicely-dressed flakes, and several scrapers.

Similar dressed flakes and scrapers are found in the caves of the South of France associated with implements of Palæolithic age; but in the case of those found near Upper Hare Park there is not sufficient evidence to prove whether they belong to the period of the gravel or were manufactured on its surface at some later period.

M. C. HUGHES

The Recent Lunar Eclipse

I WONDER whether any of the readers of NATURE who were witnesses to the almost total annihilation of the moon on Saturday night, October 4, noticed a rather strange peculiarity which was visible at about 10.50 p.m., both before and after second internal contact with shadow. When the peculiarity first appeared I cannot myself say, but I noticed it first at 10.43 when I went out to look for the almost invisible moon with the aid of a good opera-glass. In the accompanying diagram, which I have constructed from the data given in the almanacs, the moon is represented as just having emerged slightly from the shadow at 10.50 or so, when the peculiarity showed very distinctly, the moon having the appearance which is roughly represented



in the diagram, being apparently divided into two halves by a tolerably distinct line of demarcation (*bc*) running north and south (or towards the celestial pole), the right hand or westerly half appearing much darker than the left or easterly half. It is evident that an appearance like this, so striking when once noticed, could be produced in two ways, first, by the western hemisphere of the moon being actually darker than the left or eastern half; in which case the moon would have exhibited this appearance more or less throughout totality; but it did not, as I noticed nothing of the sort at 10.15, when looking through the same glasses, so that the second explanation must be resorted to. In the diagram the larger outer circle represents the border of the earth's shadow (in the case of this eclipse about 5750 miles in diameter) which is cast by the earth, irrespective of its atmosphere. The inner circle represents the border of an inner and darker shadow of the earth, cast by those of the sun's